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E-NEWS LETTER

Master of Computer Applications

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Contents:

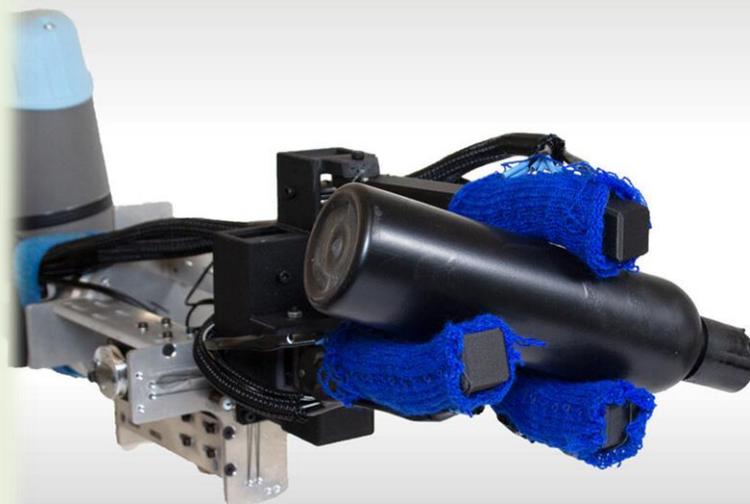
Latest Updates World	01-03
College Update	03-07
Department Activity	07-09

LATEST UPDATES WORLD

“Interactive design pipeline enables anyone to create their own customized robotic hand”

By Adam Zewe
Massachusetts Institute of Technology

MIT researchers have created an interactive design pipeline that streamlines and simplifies the process of crafting a customized robotic hand with tactile sensors.



Typically, a robotics expert may spend months manually designing a custom manipulator, largely through trial-and-error. Each iteration could require new parts that must be designed and tested from scratch. By contrast, this new pipeline doesn't require any manual assembly or specialized knowledge.

Akin to building with digital LEGOs, a designer uses the interface to construct a robotic manipulator from a set of modular components that are guaranteed to be manufacturable. The user can adjust the palm and fingers of the robotic hand, tailoring it to a specific task, and then easily integrate tactile sensors into the final design.

Once the design is finished, the software automatically generates 3D printing and machine knitting files for manufacturing the manipulator. Tactile sensors are incorporated through a knitted glove that fits snugly over the robotic hand. These sensors enable the manipulator to perform complex tasks, such as picking up delicate items or using tools.

"One of the most exciting things about this pipeline is that it makes design accessible to a general audience. Rather than spending months or years working on a design, and putting a lot of money into prototypes, you can have a working prototype in minutes," says lead author Lara Zlokapa, who will graduate this spring with her master's degree in mechanical engineering.

Joining Zlokapa on the paper are her advisors Pulkit Agrawal, professor in the Computer Science and Artificial Intelligence Laboratory (CSAIL), and Wojciech Matusik, professor of electrical engineering and computer science. Other co-authors include CSAIL graduate students Yiyue Luo and Jie Xu, mechanical engineer Michael Foshey, and Kui Wu, a senior research scientist at Tencent America. The research is being presented at the International Conference on Robotics and Automation.

Mulling over modularity

Before she began work on the pipeline, Zlokapa paused to consider the concept of modularity. She wanted to create enough components that users could mix and match with flexibility, but not so many that they were overwhelmed by choices.

She thought creatively about component functions, rather than shapes, and came up with

about 15 parts that can combine to make trillions of unique manipulators.

The researchers then focused on building an intuitive interface in which the user mixes and matches components in a 3D design space. A set of production rules, known as graph grammar, controls how users can combine pieces based on the way each component, such as a joint or finger shaft, fits together.

"If we think of this as a LEGO kit where you have different building blocks you can put together, then the grammar might be something like 'red blocks can only go on top of blue blocks' and 'blue blocks can't go on top of green blocks.' Graph grammar is what enables us to ensure that each and every design is valid, meaning it makes physical sense and you can manufacture it," she explains.

Once the user has created the manipulator structure, they can deform components to customize it for a specific task. For instance, perhaps the manipulator needs fingers with slimmer tips to handle office scissors or curved fingers that can grasp bottles.

During this deformation stage, the software surrounds each component with a digital cage. Users stretch or bend components by dragging the corners of each cage. The system automatically constrains those movements to ensure the pieces still connect properly and the finished design remains manufacturable.

Fits like a glove

After customization, the user identifies locations for tactile sensors. These sensors are integrated into a knitted glove that fits securely around the 3D-printed robotic manipulator. The glove is comprised of two fabric layers, one that contains horizontal piezoelectric fibers and another with vertical fibers. Piezoelectric material produces an electric signal when squeezed. Tactile sensors are formed where the horizontal and vertical piezoelectric fibers intersect; they convert pressure stimuli into electric signals that can be measured.

"We used gloves because they are easy to install, easy to replace, and easy to take off if we need to repair anything inside them," Zlokapa explains.

Plus, with gloves, the user can cover the entire hand with tactile sensors, rather than embedding them in the palm or fingers, as is the case with other robotic manipulators (if they have tactile sensors at all).

With the design interface complete, the researchers produced custom manipulators for four complex tasks: picking up an egg, cutting paper with scissors, pouring water from a bottle, and screwing in a wing nut. The wing nut manipulator, for instance, had one lengthened and offset finger, which prevented the finger from colliding with the nut as it turned. That successful design required only two iterations.

The egg-grabbing manipulator never broke or dropped the egg during testing, and the paper-cutting manipulator could use a wider range of scissors than any existing robotic hand they could find in the literature.

But as they tested the manipulators, the researchers found that the sensors create a lot of noise due to the uneven weave of the knitted fibers, which hampers their accuracy. They are now working on more reliable sensors that could improve manipulator performance.

The researchers also want to explore the use of additional automation. Since the graph grammar rules are written in a way that a computer can understand, algorithms could search the design space to determine optimal configurations for a task-specific robotic hand. With autonomous manufacturing, the entire prototyping process could be done without human intervention, Zlokapa says.

"Now that we have a way for a computer to explore this design space, we can work on answering the question of, 'Is the human hand the optimal shape for doing everyday tasks?' Maybe there is a better shape? Or maybe we

want more or fewer fingers, or fingers pointing in different directions? This research doesn't fully answer that question, but it is a step in that direction," she says.

COLLEGE UPDATE

1. TECHVYOM

5th May 2022 | SRMSCET, Bareilly

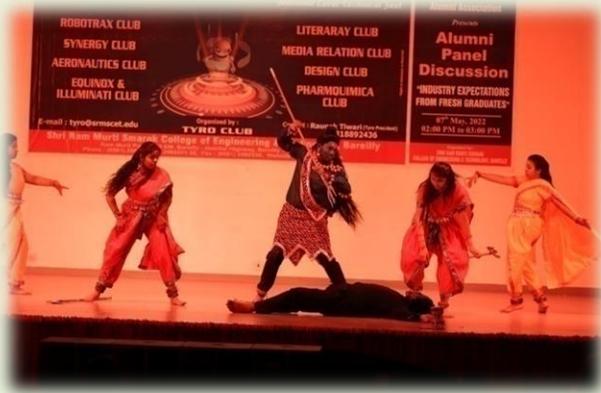
Techvyom श्री राम मूर्ति स्मारक कॉलेज ऑफ इंजीनियरिंग, बरेली में 7 मई, 2022 को आयोजित किया गया और सभी छात्रों को अपने तकनीकी कौशल का प्रदर्शन करने के लिए बड़े पैमाने पर एक अच्छा प्लैटफॉर्म दिया

समारोह का शुभारंभ माननीय अध्यक्ष श्री देवमूर्ति जी, डीन एकेडमिक सीईटी डॉ. प्रभाकर गुप्ता, निदेशक प्रशिक्षण विकास एवं प्लेसमेंट डॉ. अनुज कुमार, विभिन्न कॉलेजों के प्राचार्य, मुख्य प्रॉक्टर डॉ. ए.एस. यादव, डीन छात्र कल्याण ई. कपिलभूषण, प्रॉक्टरियल बोर्ड के सभी सदस्य, विभिन्न विभागों के प्रमुख और संकाय सदस्य की गरिमामयी उपस्थिति में हुआ

दीप प्रज्वलन समारोह को आगे बढ़ाने वाली सरस्वती वंदना और संस्थान गीत के मंत्रों से आभामंडल प्रबुद्ध हो गया। संस्कारों के बाद, गणमान्य व्यक्तियों को पौधे भेंट किए गए, जिसके बाद शिव तांडव, गणेश वंदना और छात्रों द्वारा रोबोट नृत्य किया गया, जिसने वातावरण को उत्साह से भर दिया। अंत में, माननीय अध्यक्ष श्री देव मूर्ति जी द्वारा दर्शकों को संबोधित किया गया। और टायरो अध्यक्ष रौनक तिवारी द्वारा धन्यवाद प्रस्ताव दिया गया









2. ALUMNI PANEL DISCUSSION

7th March 2022

Venue: Centennial Auditorium, SRMSCET

On the occasion of Techvyom - 2022, SRMS Alumni Association organized Alumni Panel Discussion on "Industry Expectations from Fresh Graduates" at Shri Ram Murti Centennial Auditorium, SRMS CET, Bareilly on May 07th, 2022 from 02:00 PM to 03:00 PM.



SHRI RAM MURTI SMARAK ALUMNI ASSOCIATION

PRESENTS

ALUMNI PANEL DISCUSSION

Industry Expectations from Fresh Graduates

SATURDAY, 7th MAY 2022

02:00 PM - 03:00 PM

VENUE

Shri Ram Murti Centennial Auditorium, SRMS CET, Bareilly



Website: www.srms.ac.in



DEPARTMENT ACTIVITY

1. A Farewell for MCA Final Year Students at SRMSCET, Bareilly

14TH MAY- 2022

"I cannot say goodbye to those whom I have grown to love, for the memories we have made will last a lifetime, and will never know a goodbye."

The farewell party was organized by the MCA 1st year students for the MCA final year students on 14th May-2022 at SRMSCET, Bareilly. The campus was decorated along the lines of the theme, which caught everyone's attention.

An enthralling show was arranged, with performances by all the juniors. Awards were given to the seniors keeping in mind their caliber and capability they have shown throughout the session.

Prof. (Dr.) Prabhakar Gupta, Dean Academics, Er. Subhash Mehra, Trust advisor, Dr. Anuj Kumar, HOD-MCA, Dr. L.S. Maurya Principal, SRMSCETR and other faculty members wished all the students luck for their future endeavors. They asked them to do their best and face life challenges with confidence.

Summing up, the day was great, filled with nostalgia and fun and excitement!





spirit among students. In which Mr. Vijay Kumar Dubey and other Faculty members were present to motivate students.

In this cherished activity where all the students enjoy this activity but also show their team player spirit.

This activity not only gave students a real boost to their preparation and also helps to relieve their mind and tackle the situation. All the players were holding a good time



2. Zero Hour Activity on 26th May-2022 (Cricket)

Venue: Main Ground, SRMSCET

MCA department organized a cricket activity in the zero hour activity to enhance the sportsman